

SOLE INVENTOR

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**APPLICATION FOR
UNITED STATES LETTERS PATENT**

S P E C I F I C A T I O N

TO ALL WHOM IT MAY CONCERN:

Be it known that I, **James C. Pawloski**, a citizen of the United States, residing at 3437 Pressler Court, Bay City 48706, in the County of Midland and State of Michigan, have invented a new and useful **CLOSURE DEVICE FOR A RECLOSABLE POUCH**, of which the following is a specification.

TITLE

CLOSURE DEVICE FOR A RECLOSABLE POUCH

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a continuation-in-part of U.S. Patent Application Serial No. 10/440,639, filed on May 19, 2003.

/J.P./ ^, now U.S. Patent No. 7,137,736

06/09/2008

REFERENCE REGARDING FEDERALLY SPONSORED RESEARCH OR
DEVELOPMENT

[0002] Not applicable

SEQUENTIAL LISTING

[0003] Not applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0004] The present invention relates to closures for reclosable pouches, and more particularly, to such closures that include two closure mechanisms comprised of male and female closure elements.

2. Description of the Background of the Invention

[0005] A thermoplastic bag for the storage of items typically includes a closure mechanism comprising multiple profiles disposed on opposed inner surfaces of bag walls. In a specific example, two sets of profiles are disposed on the bag walls wherein each set includes a male and a female closure element.

[0006] Ausnit U.S. Patent No. 3,656,147 discloses a plastic bag having male and female resealable interlocking elements integrally attached thereto for selectively opening and

closing an end of the bag. The bag further includes a pair of stiffener ribs formed integrally with the bag and disposed below the resealable elements to provide increased rigidity along an open end of the bag to prevent inadvertent separation of the elements.

[0007] Johnson U.S. Patent No. 6,138,329 discloses a reclosable bag having an assembly that includes first and second male arrow-shaped profiles extending perpendicularly from a first base. The assembly further includes first and second female U-shaped members extending perpendicularly from a second base to engage the first and second male profiles, respectively. Each of the male arrow-shaped profiles includes two prongs extending therefrom that engage with a female profile. The prongs of the second male profile are longer than the prongs of the first male profile to increase the opening force of the second male profile when interlocked with a respective female profile.

[0008] Malin U.S. Patent No. 6,167,597 discloses a zipper strip for a reclosable package, wherein the zipper strip includes a male and a female profile. There are at least two male interlocking members that extend from a base toward the opposite female interlocking members, wherein each male member has an asymmetrical arrow shape so that the zipper is easier to open from one side than the other. One or both of the profiles includes at least one high compression member that extends from a base thereof to touch a base of the opposite profile to allow the profiles to be sealed without crushing or distorting the interlocking members.

SUMMARY OF THE INVENTION

[0009] According to one aspect of the present invention, a reclosable pouch comprises a body portion having first and second bag walls. A first closure mechanism comprises a first male closure element and a first female closure element, wherein the first female closure element has first and second spaced legs. The first male and first female closure elements are disposed on opposing sides of the first and second bag walls. A second closure mechanism comprises a second male closure element and a second female closure element, wherein the second female closure element has third and fourth spaced legs. The second male and second female closure elements are disposed on opposing sides of the first and second bag walls.

The first male closure element includes two hook portions extending from an end thereof to engage the legs of the first female closure element and the second male closure element includes only one hook portion extending from an end thereof to engage one of the legs of the second female closure element.

[0010] According to another aspect of the present invention, a reclosable pouch comprises a body portion having first and second bag walls. A first closure mechanism comprises a first male closure element and a first female closure element, wherein the first female closure element has first and second spaced legs. The first male and first female closure elements are disposed on opposing sides of the first and second bag walls. A second closure mechanism comprises a second male closure element and a second female closure element, wherein the second female closure element has third and fourth spaced legs. The second male and second female closure elements are disposed on opposing sides of the first and second bag walls. The first male closure element includes two hook portions extending from an end thereof to engage the legs of the first female closure element and the second male closure element includes only one hook portion extending from an end thereof to engage one of the legs of the second female closure element. The first male closure element disengages from the first female closure element with a first opening force and the second male closure element disengages from the second female closure element with a second opening force that is different than the first opening force.

[0011] In yet another embodiment of the present invention, a reclosable pouch comprises a body portion having first and second bag walls. A first closure mechanism comprises a first male closure element and a first female closure element, wherein the first female closure element has first and second spaced legs. The first male and first female closure elements are disposed on opposing sides of the first and second bag walls. A second closure mechanism comprises a second male closure element and a second female closure element, wherein the second female closure element has third and fourth spaced legs. The second male and second female closure elements are disposed on opposing sides of the first and second bag walls. The first male closure element includes two hook portions extending from an end thereof to engage the legs of the first female closure element and the second male closure element includes only one hook portion extending from an end thereof to engage one of the legs of the

second female closure element. The first male closure element engages with the first female closure element with a first closing force and the second male closure element engages with the second female closure element with a second closing force that is different than the first closing force.

[0012] In a further embodiment of the present invention, a zipper tape comprises a first zipper tape portion and a second zipper tape portion. The first zipper tape portion includes a first inner surface and the second zipper tape portion includes a second inner surface. A first closure mechanism comprises a first male closure element and a first female closure element, wherein the first female closure element has first and second spaced legs. The first male and first female closing elements are disposed on opposing sides of first and second inner surfaces. A second closure mechanism comprises a second male closure element and a second female closure element, wherein the second female closure element has third and fourth spaced legs. The second male and second female closure elements are disposed on opposing sides of the first and second inner surfaces. Further, the first male closure element includes two hook portions extending from an end thereof to engage the legs of the first female closure element and the second male closure element includes only one hook portion extending from an end thereof to engage one of the legs of the second female closure element.

[0013] Other aspects and advantages of the present invention will become apparent upon consideration of the following detailed description and the attached drawings, in which like elements are assigned like reference numerals.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is an elevational view of a reclosable thermoplastic storage bag incorporating the present invention;

[0015] FIG. 2A is an enlarged, fragmentary, sectional view taken generally along the lines 2-2 of FIG. 1;

- [0016] FIGS. 2B, 3, and 4 are views similar to FIG. 2A illustrating alternative embodiments of the present invention;
- [0017] FIGS. 4A-4D are views also similar to FIG. 2A illustrating further alternative embodiments of the present invention;
- [0018] FIG. 5 is a view similar to FIG. 2A illustrating an alternative embodiment of the present invention;
- [0019] FIG. 5A is a view similar to FIG. 5 illustrating an alternative embodiment of the present invention;
- [0020] FIG. 5B is an enlarged fragmentary view of FIG. 5;
- [0021] FIG. 6 is an isometric view of an apparatus for producing bags incorporating the present invention;
- [0022] FIG. 7 is an enlarged, fragmentary isometric view of the apparatus of FIG. 6;
- [0023] FIG. 8 is an enlarged end elevational view of the apparatus of FIGS. 6 and 7;
- [0024] FIG. 9 is a diagrammatic isometric view of an extrusion apparatus for extruding zipper tape incorporating the present invention; and
- [0025] FIG. 10 is an enlarged, elevational view of a zipper tape incorporating the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

- [0026] Referring to FIG. 1, a reclosable pouch in the form of a thermoplastic storage bag 20 comprises first and second body portions 22, 24 joined to one another to form first and second bag walls 26, 28. The first and second bag walls 26, 28 are joined at first and second side portions 30, 32, respectively, and at a bottom portion 34. An opening 35 is disposed at a top portion 36 of the bag 20. First and second closure mechanisms 38a, 38b and two lips 40 are also disposed at the top portion 36 of the bag 20. The first closure mechanism 38a is disposed between the second closure mechanism 38b and an upper edge 42 of the top portion 36.

[0027] Referring to FIG. 2B, male and female closure elements or portions 44a, 44b of the closure mechanism 38a are disposed on opposing internal sides or surfaces 46, 48 of the first and second body portions 22, 24, respectively. In addition, in the embodiment of FIG. 2B, male and female elements or portions 50a, 50b of the closure mechanism 38b are disposed on the internal sides or surfaces 48, 46, respectively. Preferably, although not necessarily, the closure mechanism 38a is parallel to the closure mechanism 38b and the two are spaced from one another by a distance that is sufficiently small to create the perception that mechanisms act as a single closure. In addition, the mechanisms 38a, 38b are preferably disposed sufficiently far apart such that a user's fingers and/or thumb are guided during the closing operation. Typically, these results are accomplished by spacing the mechanisms 38a, 38b between about 0.1 inch (2.54 mm) and 0.3 inch (7.62 mm) apart, and, more preferably, between about 0.15 inch (3.81 mm) and about 0.25 inch (6.35 mm) apart and most preferably about 0.20 inch (5.08 mm) apart, although a different spacing may instead be used.

[0028] Preferably, the closure elements or portions 44, 50 have a cross sectional shape and/or may be formed in accordance with the teachings of Geiger, et al. U. S. Patent No. 4,755, 248, Zieke et al., U. S. Patent No. 4,741,789, and/or Porchia et al., U. S. Patent No. 5,012,561, owned by the assignee of the present application and the disclosures of which are hereby incorporated by reference herein. Also preferably, the first closure mechanism 38a exhibits a first closure characteristic and the second closure mechanism 38b exhibits a second closure characteristic different than the first closure characteristic. For example, either or both of the first and second closure mechanisms 38 may exhibit a relatively low level of resistance to bag opening forces but provide a high level of deformation so as to exhibit a clicking feel and/or sound when the bag is opened or closed. In addition, either or both of the first and second closure mechanisms 38 may exhibit a low level of deformation but provide a relatively high overall resistance to bag opening forces. Either or both of the male closure elements 44a, 50a may be symmetric or asymmetric about a longitudinal centerline thereof and either or both of the female closure elements 44b, 50b may be symmetric or asymmetric about a longitudinal centerline thereof. Thus, for example, either or both of the first and second closure mechanisms 38 may have an asymmetric configuration so that the closure mechanism 38 exhibits a first resistance to opening forces exerted on one side of the

mechanism 38 and further exhibits a second, different resistance to opening forces exerted on another side of the mechanism 38.

[0029] In a specific embodiment, the first closure mechanism 38a exhibits a high degree of deformation so as to develop a clicking feel when the bag is opened or closed. Preferably, the first closure mechanism 38a is produced in accordance with the teachings of Dais et al., U. S. Patent No. 5,140,727, owned by the assignee of the present application and the disclosure of which is hereby incorporated herein. In addition, the second closure mechanism 38b provides a relatively high overall resistance to opening forces. In addition, each closure mechanism 38a and 38b exhibits a first resistance to opening forces exerted from inside the bag (i.e., on the side between the bottom portion 34 of the bag and the closure mechanisms 38) and a second, lower resistance to opening forces exerted from the opposite side of the closure mechanisms 38 (i.e., on the side between the upper edge 42 and the closure mechanisms 38.) This differential opening force characteristic is accomplished by asymmetrically configuring the male closure elements 44a and 50a and/or the female closure elements 44b and 50b as noted above. In the preferred embodiment, each of the closure mechanisms 38a, 38b exhibits substantially the same first resistance to opening forces exerted on the side between the upper edge 42 and the closure mechanisms 38. In addition, each of the closure mechanisms 38a, 38b exhibits substantially the same second resistance to opening forces originating between the bottom portion 34 of the bag and the closure mechanisms 38. The second resistance is greater than the first resistance. It should be noted that the first closure mechanism 38a may provide the same or different resistance to opening forces as compared with the resistance provided by the second closure mechanism 38b with respect to forces originating from inside the bag and/or from the opposite side of the closure mechanism 38.

[0030] In addition, if desired, both of the closure mechanisms 38a and 38b or just the closure mechanism 38b may exhibit a high degree of deformation so as to develop a clicking feel when the bag is opened or closed. Still further, more than two closure mechanisms 38 may be provided wherein the closure mechanisms 38 have differing or the same closure characteristic(s) and the closure mechanisms act together as a single unit to allow the user to open and close the bag.

[0031] If desired, and as seen in FIGS. 2A, 3, and 4, one or more strips 60 could be provided between the closure mechanisms 38a, 38b (optionally out of contact, i.e., not touching, the adjacent closure elements) on either or both of the internal sides or surfaces 46, 48. The strips 60 may be colored or uncolored and may lend stiffness to the structure. According to a first embodiment, the male closure element 44a, the female closure element 50b and an optional strip 60a disposed between the elements 44a and 50b are colored pink, whereas the female closure element 44b and the male closure element 50a are colored blue. An optional further strip 60b may be disposed on the surface 48 between the closure elements 44b and 50a and may be colored blue. The size and shape of the strips 60 may be selected as desired to obtain a desired feel and/or stiffness.

[0032] As a further alternative, each of the optional strips 60 may simply comprise a thin colored coating, such as very thin layer of colored thermoplastic, a colored epoxy, a layer of paint, etc...

[0033] FIG. 3 illustrates a further embodiment wherein like reference numbers denote structures common to the various embodiments. As seen in FIG. 3, the male closure elements 44a and 50a are disposed on the internal side or surface 46 and the female closure elements 44b and 50b are disposed on the internal side or surface 48. In this embodiment, a single strip 60a is provided between the male elements 44a and 50a on the internal side or surface 46. Additionally or alternatively, a strip 60b (seen in phantom in FIG. 3) may be provided between the female closure elements 44b and 50 on the internal side or surface 48. One or more additional strips may be provided on either or both surfaces 46, 48. If desired, other structures might be included with the closure mechanisms and the strips. For example, one or more guide ribs (not shown) could be provided to further assist in guiding of the user's fingers. Further, any or all of the strips 60 and/or other structures may be disposed between the closure mechanisms 38a, 38b or may be disposed outside of (i.e., above or below as seen in FIG. 1) the mechanisms 38a, 38b.

[0034] In any of the embodiments disclosed herein, one or more gripping ribs 74 may be disposed on the internal surfaces 46, 48 of the bag 20 between the closure mechanisms 38a and 38b and the top portion 36 of the bag 20, wherein the gripping ribs 74 are integrally

extruded with the walls of the bag. Any number of gripping ribs 74 can be used, although space is necessary between adjacent ribs in order to facilitate a gripping action with a user's fingers. In a preferred embodiment, about six or seven gripping ribs 74 are disposed on each lip 40 of the bag.

[0035] As seen in FIG. 3, each male closure element 44a, 50a comprises an arrow-shaped engagement member 80, 82, respectively, and a base member 84, 86, respectively. Each female closure element 44b, 50b comprises a C-shaped profile member 90, 92, respectively, joined to base members 94, 96, respectively. The base members 84, 86 are only slightly wider than the engagement members 80, 82 and the base members 94, 96 are only slightly wider than the side-to-side extent (as seen in FIG. 2A) of the C-shaped profile members 90 and 92. The same is true of the embodiment of FIG. 2A. In both of these embodiments relatively little resin is required to form the closure mechanisms 38. In fact, it is believed that only a minimal increase in resin is needed to produce the closure elements 38 compared to a standard bag design utilizing a single closure mechanism, and yet a closure is obtained that has a wide-track feel and superior resistance to inadvertent opening.

[0036] FIG. 4 illustrates yet another embodiment of the present invention wherein the closure mechanisms 38a, 38b are replaced by closure mechanisms 138a, 138b. The mechanism 138a includes male and female closure elements 144a, 144b and the mechanism 138b includes male and female closure elements 150a, 150b. The mechanisms 138a, 138b are identical, and hence, only the closure mechanism 138a will be discussed in detail. The male closure element 144a of the closure mechanism 138a comprises a base 154 integral with flanking side members 156 and 158 and an arrow-shaped engagement member 160 that extends from the base 154. A female closure element 144b comprises a base 162 with a C-shaped profile member 164 extending therefrom, wherein the female closure element 144b is adapted to receive the male closure element 144a when pressure is exerted on the closure elements by a user's finger(s) during closing of the bag. The side members 156 and 158 are of a sufficient size and proximity to the engagement member 160 such that the side members 156 and 158 move together with the member 160 when the members 160 and 164 are engaged and disengaged. The side members 156 and 158 also have a height that is less than the height of the engagement member 160, and the members 156 and 158 extend beyond tips

168 of the female profile member 164 when the engagement member 160 is engaged with the female profile member 164. Thus, at such time, the tips 168 of the female profile member 164 reside between the side members 156 and 158 and the male engagement member 160.

[0037] As in the previous embodiments, the male closure elements 144a, 150a may be disposed on the same bag wall or on different bag walls, as may the female closure elements 144b, 150b.

[0038] As should be evident by a comparison of FIGS. 3 and 4, the base members 84, 86, 94, and 96 of FIG. 3 are replaced by elongate members 180, 182, 184, 186, respectively, and hence, more resin is required to produce the closure mechanisms 138a, 138b as compared to the closure mechanisms 38a, 38b. However, the elongate members 180-186 further promote guiding of the user's fingers and thumb during closing of the bag. One or more strips 187 identical or similar to the strip(s) 60 may be provided as noted in connection with the previous embodiments.

[0039] If desired, in any of the embodiments described herein, adjacent closure elements may be interconnected by a web of film. Thus, for example, FIG. 4A illustrates modifications to the embodiment of FIG. 2A wherein the female closure element 44b is interconnected to the male closure element 50a by a web 188a that is integrally or separately extruded with the elements 44b and 50a. In addition, the male closure element 44a may be interconnected to the female closure element 50b by a web 188b that is integrally or separately extruded with the elements 44a, 50b. FIG. 4B illustrates the same features in connection with the embodiment of FIG. 3. That is, in FIG. 4B, the female closure elements 44b and 50b are interconnected by a web 188c whereas the male closure elements 44a and 50a are interconnected by a web 188d.

[0040] Optionally, in FIGS. 4A and 4B, the closure elements 44, 50 and/or the webs 188a-188d may have the same or different visual characteristic(s). Suitable visual characteristics include visual material characteristics such as transparency, translucency or opaqueness, coloring of transparent, translucent, or opaque material by dye or other suitable colorants, printing or embossing of indicia, or the like. For example, portions or the entirety of the web 188a may have a first visual characteristic, such as pink coloring, and portions or

the entirety of the web 188b may have a second, different visual characteristic, such as blue coloring. In addition, and taking the embodiment of FIG. 4A as an example, portions or the entirety of one or both of the closure elements 44a and 50b may have the same or a different visual characteristic as the web 188b or 188a. The same may be true of the closure elements 44b, 50a relative to the visual characteristic of the web 188a or 188b. When the respective closure elements 44a, 44b and 50a, 50b are mated, the first and second visual characteristics, such as the pink and blue colorings, respectively (if used), blend together to form a single visual characteristic, such as purple coloring, indicating full closure thereof. If desired, central portions of the webs 188a, 188b intermediate the closure elements 44b, 50a and 44a, 50b, respectively, (or corresponding intermediate portions of the webs 188c, 188d) may be thickened so that such portions come into contact with one another when the closure elements 44, 50 are occluded. This can enhance the color change effect and provide a tactile confirmation of closure. In addition to the foregoing, any of the webs may include any tactile characteristic including, but not limited to, embossing, a thicker feeling, or a cushioned feeling. Alternatively, intermittent portions along the lengths of the closure elements 44, 50 and/or webs 188a-188d may have any visual or tactile characteristic. For example, referring to the embodiment of FIG. 4B, the web 188c may have a first alternating pattern formed by separate portions along the length thereof (i.e., from side-to-side of the bag 20) that have a visual characteristic comprising pink coloring and remainder portions of the web 188c intermediate the pink portions that have a different visual characteristic, such as translucent uncolored (i.e., clear) portions. In addition, the web 188d may have a second alternating pattern of pink and clear (or another visual characteristic) portions that are disposed at least partially out of phase with respect to the first alternating pink and clear (or other visual characteristic) pattern of the web 188c. Preferably, although not necessarily, the first alternating pattern is a regular pattern (i.e., the pink portions are all of substantially the same first length, and the remaining clear portions are all of substantially the same second length, where the first and second lengths are equal or unequal) and the second alternating pattern is identical to the first alternating pattern, but is displaced 180 degrees with respect thereto. When the closure elements 44a, 44b and 50a, 50b are correctly mated, the alternating pink and clear (or other visual characteristic) portions of the webs 188c, 188d come together to

form a substantially full line of substantially uniform color (or other visual characteristic) to indicate closure thereof. As should be evident from the foregoing, any portion of any of the webs 188 and/or closure elements 44, 50 may be any visual characteristic, including different colors, clear, translucent, or opaque material, or printed indicia, and opposite webs and/or closure elements 44, 50 may have the same visual characteristic(s) or different visual characteristic(s) to assist in providing a visual indication of at least partial occlusion of the closure elements 44, 50.

[0041] As seen in FIGS. 4C and 4D, webs 288a-288d may also be separately extruded onto the body portions 22, 24 intermediate and separate from the closure elements 44a, 44b, 50a, and 50b. Any of the embodiments described above in connection with FIGS. 4A and 4B are possible for the configurations shown in FIGS. 4C and 4D. The webs 288a-288d may also be made from any material including, but not limited to, a thermoplastic material or a foam material. For example, in FIG. 4C, the web 288a may have a first visual characteristic such as a translucent blue coloring and the web 288b may have a second visual characteristic such as a translucent yellow coloring, such that when the respective closure elements 44a, 44b and 50a, 50b are mated, the blue and yellow colors blend together to form a visual characteristic such as a green color that indicates full closure of the closure elements 44a, 44b and 50a, 50b. Further, in FIG. 4D, intermittent portions of the web 288c may have any visual characteristic, such as white coloring, to form a third regular or irregular alternating pattern of alternating white and clear portions and intermittent portions of the web 288d may have a visual characteristic including white coloring to form a fourth regular or irregular pattern of alternating white and clear portions wherein the third pattern is preferably (although not necessarily) identical to the fourth pattern, but displaced 180 degrees with respect thereto. As in the previous embodiment, when the closure elements 44a, 44b and 50a, 50b are mated, the alternating portions of the web portions 288c, 288d line up to form a full line of a visual characteristic (in this embodiment, a continuous white line) to indicate closure thereof. Also as in the previous embodiment, the thicknesses of the webs 288c, 288d may be such that at least portions of the webs 288c, 288d contact one another to enhance color change when the closure elements 44, 50 are properly mated.

[0042] As mentioned above, any of the webs 188a-188d or 288a-288d may have a visual characteristic including printed indicia thereon. For example, a first web may comprise a clear material with printed indicia including, for example, the word “closed” printed on an inner surface thereof and a second, opposing web may have a visual characteristic comprising a clear material. When the respective closure mechanisms are mated, the word “closed” appears through the second web to indicate full closure thereof. Alternatively, a word such as “closed” may be printed on inner surfaces of first and second clear webs at laterally spaced locations such that when the respective closure mechanisms are properly mated, the word “closed” appears clearly through the first and second webs at the laterally spaced locations to indicate full closure thereof. Printed indicia are not limited to words, but can also include any number, patterns, designs, or the like.

[0043] FIG. 5 illustrates yet another embodiment of the present invention, wherein the closure mechanisms 38a, 38b are replaced by first and second closure mechanisms 238a, 238b, respectively. The first closure mechanism 238a comprises a first male closure element 244a and a first female closure element 244b. Both the first male and female closure elements 244a, 244b are substantially symmetric about a centerline 246, as may be seen in FIG. 5. The first male closure element 244a includes an engagement member 250 having two hook portions 251a, 251b that extend from a base 248a. The first female closure element 244b includes a base 248b with a first spaced leg 252 and a second spaced leg 254 extending therefrom. The first female closure element 244b is adapted to receive the first male closure element 244a when pressure is exerted on the closure elements by a user's finger(s) during closing of the bag. In a preferred embodiment, the second closure mechanism 238b comprises a second male closure element 256a and a second female closure element 256b. In this embodiment, the first female closure element 244b of the first closure mechanism 238a is substantially or completely identical to the second female closure element 256b of the second closure mechanism 238b. As such, the second female closure element 256b includes a base 258b with a third spaced leg 260 and a fourth spaced leg 262 extending therefrom. The second female closure element 256b is also adapted to receive the second male closure element 256a when pressure is exerted on the closure elements by a user's finger(s) during closing of the bag. The second male closure element 256a includes an engagement member

264 comprising only one hook portion 265 that extends from a base 258a. As should be evident, the second male closure element 256a is substantially asymmetric about a longitudinal centerline 266. As may be seen in FIG. 5, the first female closure element 244b of the first closure mechanism 238a is adjacent the second male closure element 256a of the second closure mechanism 238b on the first bag wall 26. The first female closure element 244b is also disposed closer to an upper edge 42 of the pouch on the first bag wall 26 than the second male closure element 256a. Additionally, the first male closure element 244a of the first closure mechanism 238a is adjacent the second female closure element 256b of the second closure mechanism 238b on the second bag wall 28. The first male closure element 244a is disposed closer to an upper edge 42 of the pouch on the second bag wall 28 than the second female closure element 256b. In another embodiment depicted in FIG. 5A, the first female closure element 244b of the first closure mechanism 238a is adjacent the second female closure element 256b of the second closure mechanism 238b on the first bag wall 26, while the first male closure element 244a of the first closure mechanism 238a is adjacent the second male closure element 256a of the second closure mechanism 238b on the second bag wall 28.

[0044] In a preferred embodiment, the first closure mechanism 238a is opened by disengaging its respective closure elements 244a, 244b with a first opening force and the second closure mechanism 238b is opened by disengaging its respective closure elements 256a, 256b with a second opening force. Both the first and second opening forces comprise respective internal and external opening forces. In one embodiment, the first male closure element 244a disengages from the first female closure element 244b with a first external opening force and the second male closure element 256a disengages from the second female closure element 256b with a second external opening force. The first and second external forces are substantially exerted from a side of the bag nearer the upper edge 42, as opposed to internal bursting forces that act on the closure mechanisms 238a, 238b from within the pouch. In a preferred embodiment, the first closure mechanism 238a primarily determines the external opening force of the bag whereby the first external opening force is larger than the second external opening force. This difference in forces results from the fact that first male closure element 244a of the first closure mechanism 238a has the hook portion 251a whereas

the second male closure element 244a lacks a hook portion in a corresponding location (i.e., toward the upper edge 42). The elimination of an extra portion on the opposing side (toward the upper edge 42) of the engagement member 264 allows for the second female closure element 256b to flex less around the second male closure element 256a during opening of the bag 20. The result of the reduced flexing in the second closure mechanism 238b is a lower external opening force than exhibited by the first closure mechanism 238a. Additionally, as seen in FIG. 5B, the second male closure element 256a has a thickness A at a root portion 268 of the engagement member 264 and a thickness B at the widest part of the hook portion 265. In a preferred embodiment, the thicknesses A and B are substantially equal. Alternatively, the thickness B can be increased, thereby increasing the external opening force developed by the closure mechanism 238b.

[0045] Like the other embodiments, the embodiment illustrated in FIG. 5 includes two closure mechanisms wherein the first closure mechanism 238a exhibits a first closure characteristic and the second closure mechanism 238b exhibits a second closure characteristic. Preferably, the second closure characteristic comprises a first resistance to an external opening force applied to a first side of the second closure mechanism 238b and a second resistance to an internal opening force applied to a second side of the second closure mechanism 238b. As mentioned above, the second closure mechanism 238b preferably has a very low external opening force because the second male closure element 256a includes only one hook portion 265 that is directed toward the inside of the bag 20. Therefore, the second closure mechanism 238b is more apt to withstand internal bursting forces as opposed to external opening forces. The first closure mechanism 238a, in effect, controls the external opening force of the bag 20, whereas the second closure mechanism 238b primarily determines the resistance to burst forces exerted from within the bag 20.

[0046] In a further embodiment of the present invention, the first closure mechanism 238a exhibits a clicking feel and/or sound when the bag is opened or closed. Such a clicking feel is created by providing a high level of deformation within the first closure mechanism 238a. The first male and female closure elements 244a, 244b may be similar in structure to the embodiments characterized in FIGS. 2A and 2B, which also provide for a high level of deformation.

[0047] As should be evident, the first male closure element 244a engages with the first female closure element 244b with a first closing force and the second male closure element 256a engages with the second female closure element 256b with a second closing force. In one embodiment, the first closing force is greater than the second closing force. In another embodiment, the second closing force is greater than the first closing force. Still further, other embodiments have first and second closing forces that are approximately equal. For example, for a zipper at a 64 mil thickness (1.6 mm) an average closing force for the first closure mechanism 238a was found to be 0.15 lb. (0.07 kg.), an average closing force for the second closure element 238b was found to be 0.05 lb. (0.02 kg.), and the overall closing force for the combined mechanisms 238a, 238b was found to be 0.20 lb. (0.09 kg.). When the zipper thickness was increased to 75 mils (1.9 mm) an average closing force for the first closure mechanism 238a was found to be 0.18 lb. (0.08 kg.), an average closing force for the second closure element 238b was found to be 0.06 lb. (0.03 kg.), and the overall closing force for the combined mechanisms 238a, 238b was found to be 0.24 lb. (0.11 kg.). Preferably, the overall closing force of the first and second closure mechanisms 238a, 238b is within the range of about 0.10 – 0.45 lb. (0.05 to 0.20 kg.), and more preferably in the range of about 0.15 to 0.35 lb. (0.07 to 0.16 kg.), and most preferably in the range of about 0.20 to about 0.30 lb. (0.09 to 0.14 kg.). An overall closing force within the most preferred range allows a dual closure mechanism bag to have a similar overall closing force to those found in conventional single closure mechanism bags. The present embodiment allows for a significantly stronger dual closure mechanism bag while also allowing the user to “feel” as if he were using a single closure mechanism bag with a wide-track feel.

[0048] Reclosable thermoplastic storage bags as described herein can be produced by any suitable bag-making process, such as a cast post applied process, a cast integral process, a blown process or any other process known in the art. It should be noted that the extrusion die(s) used to form the closure mechanisms and strip(s) must include a suitable number of profile plates to form such structures. In addition, an air nozzle may be provided in association with each female closure element that blows air into the opening of each C-shaped female profile member to open the member as it is being extruded. In addition, one or

more cooling water jets may be provided to cool the male and female closure elements after they are extruded.

[0049] If desired, an alternative post applied process can be used to produce any of the bags disclosed herein, such as seen in FIGS. 6 and 7. Referring to such FIGS., the alternative post applied process utilizes an extrusion apparatus including a first extrusion slot die 300, a temperature-controlled driven casting roll 302, edge pinning devices or apparatus 304a, 304b, an air knife 306, second and third extrusion dies 308a, 308b (that are diagrammatically shown and which, together with the die 300, form the extrusion apparatus) and blowing apparatus 310a, 310b. The extrusion die 300 receives molten thermoplastic from an extruder (not shown) and deposits the thermoplastic in sheet form as a web 312 onto the casting roll 302. The extrusion die 300 includes a slot opening (not shown) that forms thickened areas 314, 316 at outside edge portions 318a, 318b of the resulting web 312 and a relatively thinner portion 320 intermediate the thickened areas 314, 316. The edge portions 318a, 318b are pinned to the casting roll 302 by the edge pinning devices 304a, 304b, respectively. The web 312 is then pinned across the entire width thereof (i.e., as a whole) to the casting roll 302 by the air knife 306.

[0050] After the web 312 is pinned to the casting roll 302, the male and female closure elements 44, 50 or 144, 150 are formed on the web 100. Preferably, the extrusion dies 308a, 308b receive molten thermoplastic from separate extruders and extrude the male and female closure elements 44, 50 or 144, 150 onto the thickened areas 314, 316. Alternatively, the separate extrusion dies 308a, 308b may be replaced by a single extrusion die having two outlets at which the male and female closure elements 44, 50 or 144, 150 are simultaneously extruded onto the thickened areas 314, 316. As a still further alternative, each extrusion die 308a, 308b may be replaced by two or more extrusion dies that individually and separately extrude the closure elements 44, 50 or 144, 150 and the strip(s) 60, 187. In any event, as seen in FIG. 8, the angle of a face 322 of each die 308 is at least initially disposed substantially parallel to a horizontal radial line 324 extending from the center of the casting roll 302. The position of the die 308 (or each die 308a, 308b individually if separate dies are used) may then be adjusted by moving the die left, right, up, or down (all as seen in FIG. 8) or the die may be tipped (i.e., angularly displaced) to adjust the angle of the die face 322 to obtain

desirable results. The closure elements 44, 50 or 144, 150 formed by the die(s) 308 may exit the die(s) 308 at a point coincident with a vertical tangent line 326 (FIG. 8) intersecting the surface of the casting roll 302 on the side of the casting roll 302 where the web 312 is first deposited thereon. Alternatively, the closure elements 44, 50 or 144, 150 formed by the die(s) 308 may exit the die(s) 308 at a point displaced to the right or left (as seen in FIG. 8) of the tangent line 326. If the extrudate exits the die(s) 308 at a point displaced to the right of the line 326, some provision must be made at the initiation of production to attach the extrudate stream to the casting roll 302. Thereafter, production may commence, (provided that the exit of the die(s) 308 is not disposed too far to the right of the tangent line 326) whereupon the melt strength of the extrude stream carries the stream into contact with the roll 302.

[0051] Once the molten thermoplastic from the die(s) 308 has been deposited onto the web 312, coolant is applied to the closure elements 44, 50 or 144, 150 by coolant apparatus (not shown) to bring the temperature thereof below the melting point of the thermoplastic material forming the closure elements 44, 50 or 144, 150 as quickly as possible. Preferably, the coolant comprises water or any other suitable cooling fluid and the coolant is applied to the material of the closure elements 44, 50 or 144, 150 only after such material contacts the material of the web 312 so that adhesion thereto is optimized. The web 312 and the closure elements 44, 50 or 144, 150 are maintained in contact with the temperature-controlled casting roll 302 for a period of time as the roll 302 is rotated so that the web 312 and closure elements 44, 50 or 144, 150 are further cooled. The casting roll 302 should be maintained at a temperature below the melting point of the thermoplastic material(s) forming the web 312 and the closure elements 44, 50 or 144, 150, typically about 20-80 degrees C.

[0052] If desired, any of the closure elements and/or strips and/or other associated structures of the above embodiments can be integrally or separately extruded on internal surfaces of flanges to form zipper tape that is subsequently post-applied to film in a bag production process. For example, as seen in FIG. 9, the zipper tape includes a first zipper tape portion 400 and a second zipper tape portion 402 that may be extruded separately by an extrusion die 404 into a water bath 406. If desired, more than one extrusion die may be employed for this purpose. The zipper tape portions 400, 402 extend about pulleys or rollers

408, 410, respectively, in the water bath 306 and may further extend about additional pulleys or rollers 412, 414 and 416, 418 out of the water bath 406. The zipper tape portions 400, 402 may thereafter pass through a dewatering station 420, where the water is removed therefrom, and the portions 400, 402 may be joined together (i.e., occluded) by nip rollers 422. The occluded portions 400, 402 may thereafter be stored on spools or reels or the occluded portions may be directly delivered to an in-line bag manufacturing apparatus, where the portions 400, 402 are laminated or otherwise secured to bag film.

[0053] Referring to FIG. 10, the first zipper tape portion 400 includes a first inner surface 430 and closure elements 444b and 456a secured to the first inner surface 430. The second zipper tape portion 402 includes a second inner surface 432 and closure elements 444a and 456b secured to the second inner surface 432. The closure elements 444b, 456a, 444a, and 456b may be similar or identical to the closure elements 244b, 256a, 244a, and 256b, respectively, described above. In some embodiments, the zipper tape may be relatively thicker at areas that ultimately form the top of the bag and relatively thinner at areas where the zipper tape is to be joined to the film. Also, gripping strips (not shown) may be formed at the areas that ultimately form the top of the bag.

INDUSTRIAL APPLICABILITY

[0054] The pouch described herein advantageously allows for dual closure mechanism pouches to be used that have opening and closing force characteristics similar to those found in single closure mechanism pouches. Thus, closing and opening efficiency is increased and the expenditure of wasted effort by the user is minimized.

[0055] Further, the pouch of the present invention can provide aural and tactile feedback of closing and opening of the pouch. Still further, the present pouch can provide a plurality of different closure characteristics and can provide greater security against inadvertent opening of the pouch. The distance between the closure mechanisms can be varied as desired, and the male and female closure elements may be disposed on either wall with or without strip(s) therebetween. Other structure(s) may be disposed between or outside of the closure mechanisms, as desired.

[0056] Numerous modifications will be apparent to those skilled in the art in view of the foregoing description. Accordingly, this description is to be construed as illustrative only and is presented for the purpose of enabling those skilled in the art to make and use the invention and to teach the best mode of carrying out same. The exclusive rights to all modifications which come within the scope of the appended claims are reserved.